5 DEBUGGER INTERFACE REFERENCE

Overview

The VisualDSP Debugger provides a simulation and test environment for the programs that you develop using the VisualDSP Environment. After you build an executable program for your project, you use the debugger to test and debug it. The Environment and the Debugger are integrated so you can move back and forth quickly between the two when debugging your project.

The screen shots and examples in this manual were created using example programs based on Analog Device's ADSP-21xxx SHARC processors and are shown for reference only. Menu and dialog selections as well as data that appears in windows changes depending on the processor you are using.

The VisualDSP Debugger is the front end for all of the available Targets and Platforms. Because the debugger is dynamic, when you attach to a different Target, the menu commands and some window displays change. Furthermore, when you choose a different Platform or processor, other menus, primarily the `Registers` and `Memory` menus, also change.

This section provides reference information on all VisualDSP commands, dialogs and options that are unique to the debugger. Descriptions of standard Windows 95 commands such as `File, Open`, or `Window, Tile`, are omitted from this manual, but are available through the debugger's `Help`

menu. This section also provides lists of all keyboard short cuts and tool-bar icons. The reference is organized as follows:

- "File Menu Commands" on page 5-3
- "Session Menu Commands" on page 5-8
- "Debug Menu Commands" on page 5-29
- "Settings Menu Commands" on page 5-34
- "Register Menu Commands" on page 5-21
- "Memory Menu Commands" on page 5-23

This section uses the ADSP-21000 Simulator as the debug target but does not describe processor-specific memory or registers. For information on these, see the Processor's user manual. For information on debugger menus and commands specific to emulation, see "Emulation Setup & Test" in Chapter 6.

File Menu Commands

The debugger `File` menu lets you access and load files and exit the debugger.

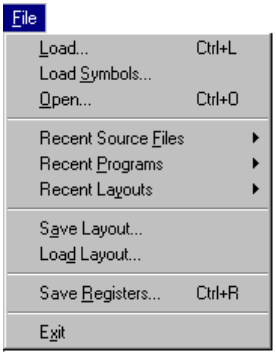


Figure 5-1. File Menu

Load

Loads an executable or multiprocessor (MP) project executable file (`.dxe`) into the debugger. You may invoke this command at any time during a debug session. Select the file to load in the `Open a Processor Program` dialog.

When you load an MP project, the `Load Multiprocessor Confirmation` dialog opens (Figure 5-2 on page 5-4). From this dialog, you can confirm that the correct program is loaded into the correct processor, or, by clicking the `Scan` button you can scan any MP executable to load into the processors in your MP project.

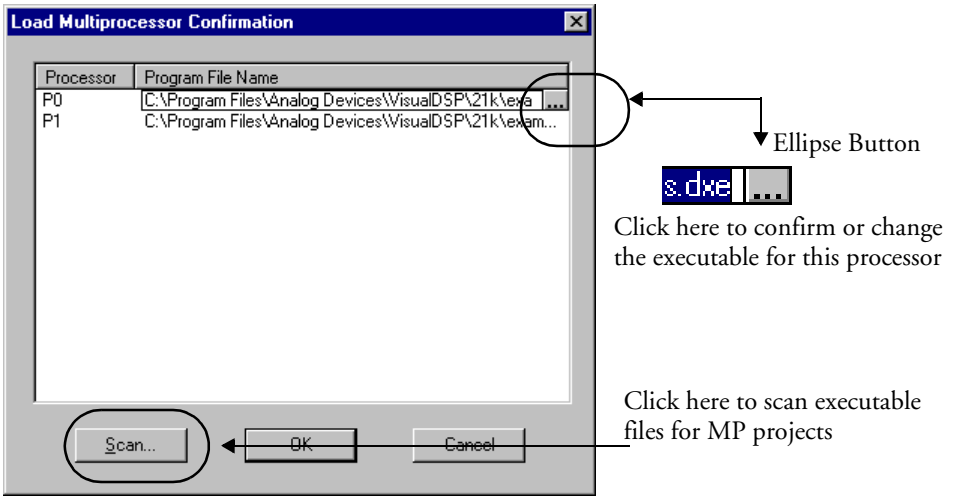


Figure 5-2. Load Multiprocessor Confirmation Dialog

When you click the Scan button, the `Select a processor Program to Scan` opens. Select the MP executable file for your debug session and click `OK`.

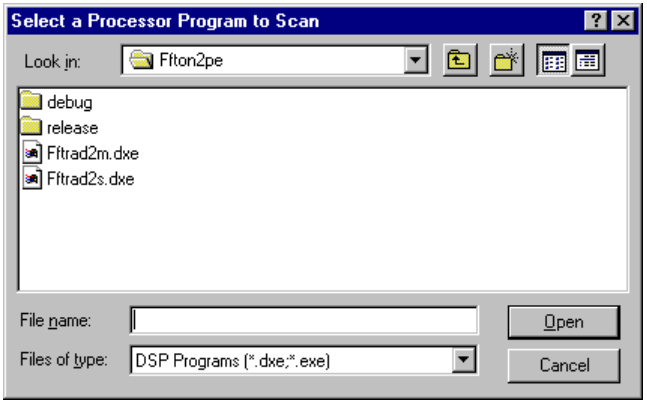


Figure 5-3. Select a processor Program to Scan

When you do this, the `Select a Processor to Load` dialog lets you confirm the executable you select is loaded into the correct processor.

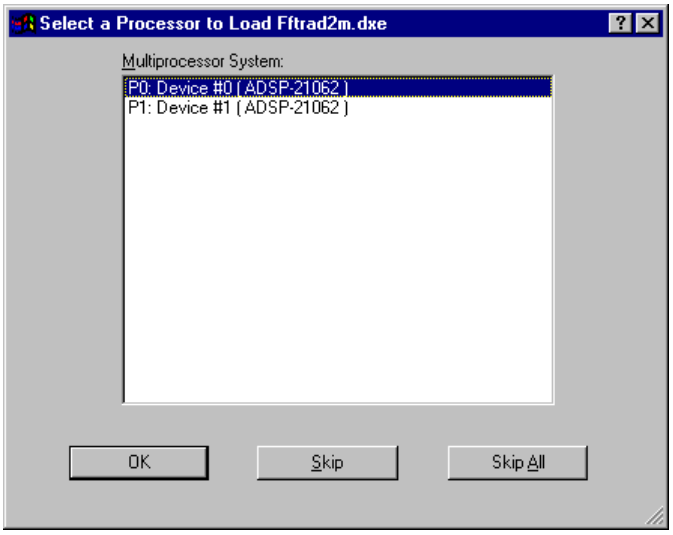


Figure 5-4. Select a Processor to Load Dialog

Note that when you start the debugger from the Environment, the debugger automatically loads the current project's executable file.

- Keyboard Short cut: Ctrl + L
- Accelerator Keys: Alt F L

Open a Processor Program Dialog

Use this dialog to select and load an executable or multiprocessor project executable (`.dxe`) program.

Load Symbols

Loads only an executable file's (`.dxe`) symbols. This command is useful when you have a ROM-coded target and only want to view your codes' labels in memory windows. Select the file to load in the `Load a Processor Program's Symbols` dialog.

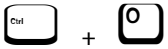
- Accelerator Keys:

Load a Processor Program's Symbols Dialog

Use this dialog to load an executable file's symbols.

Open

Opens any file. Use this command to open any source or other text file while debugging.

- Accelerator Keys:
- Keyboard Short cut: 

File Open Dialog

Use this dialog to open any file.

Recent Files

Lists the last four source/program/layouts. These files and settings may be reloaded by selecting the name from this list.

Save/Load Layout

Saves the screen layout of the current debug session. Use these commands to save and restore the Windows setup of the current session. This command does not load the DSP program. You must reload the executable file to continue debugging.

Session Menu Commands

The `Session` menu lets you manage multiple debugging sessions. You can start a new session, select between current sessions, and clear or delete sessions. You may have as many sessions open as your system's memory can handle. Sessions are saved on exit. For more information, see "Defining Debugger Sessions" in Chapter 4.

The `Sessions` menu has the following commands:

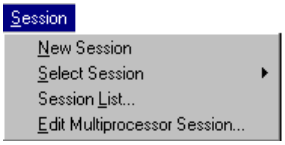


Figure 5-5. Session Menu

- Accelerator Keys:

New Session

Starts a new debug session. Use the `Target Selection` dialog to set session attributes.

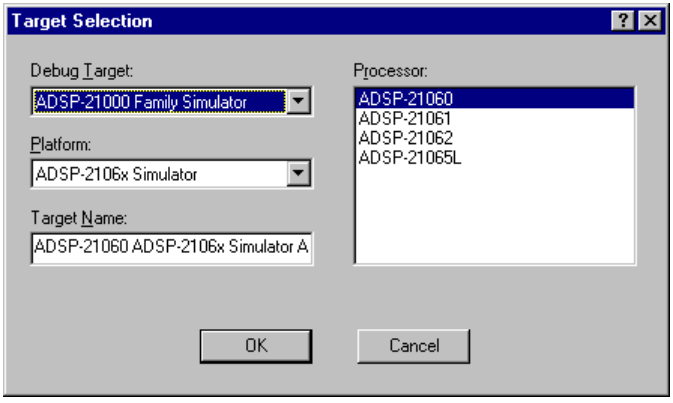


Figure 5-6. Target Selection Dialog

- Accelerator Keys: Alt S N

Select Session

Select a debug session from the list of currently active sessions.

- Accelerator Keys: Alt S S

Session List

Provides commands that let you manage your debug sessions. In this dialog you can delete, delete all, activate previous sessions, and view and edit multiprocessor sessions.

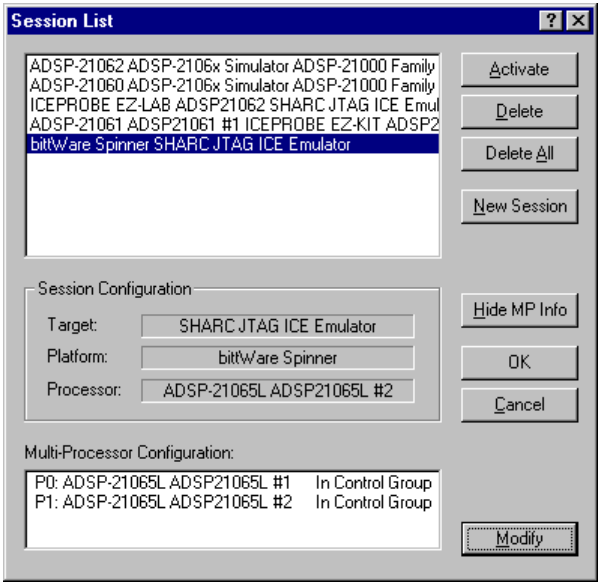


Figure 5-7. Session List Dialog

- Accelerator Keys:

View Menu Commands

Use the `View` menu to control the information displayed in the debugger windows, to open new windows, and to find text or go to a memory address.

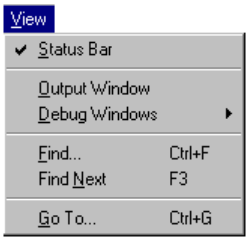


Figure 5-8. View Menu

- Accelerator Keys:

Output Window

Opens the debugger's output window. The output window displays debugger status and error messages. This window also acts as an interface to Tcl, which runs in the debugger. For more information, see "Tcl Scripting" on page A-1. All status and error messages written to the output window are saved to the text file `C:\Program Files\VisualDSP\Data\VisualDSP_log.txt`.

This file is appended for all sessions so you may want to occasionally open this file and delete parts or all of it.

The output window has a short cut menu which controls its properties:

Fixes the window to the bottom of the GUI
Clears all of the text in the window
Allow Docking
Hide
Clear All
Float In Main Window
Closes the window
Lets you move the window around the GUI

Figure 5-9. Output Window Short Cut Menu

- Accelerator Keys:

Debug Windows

Provides access to the following windows.

Disassembly Window

Opens a window that displays your code in disassembled form. The disassembly window displays a letter denoting the instruction pipeline operation being executed. These letters are located at the left of the disassembly window and are as follows:

- A = Abort
- > = Execute
- D = Decode
- F = Fetch

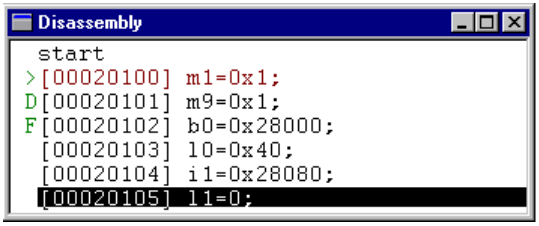


Figure 5-10. Disassembly Window

- Accelerator Keys: Alt V D D

Execution Trace Window

Displays a history of processor activity during program execution. Use the `Settings, Trace` command to enable program trace and to set a trace depth. Right click in this window to display a short cut menu.

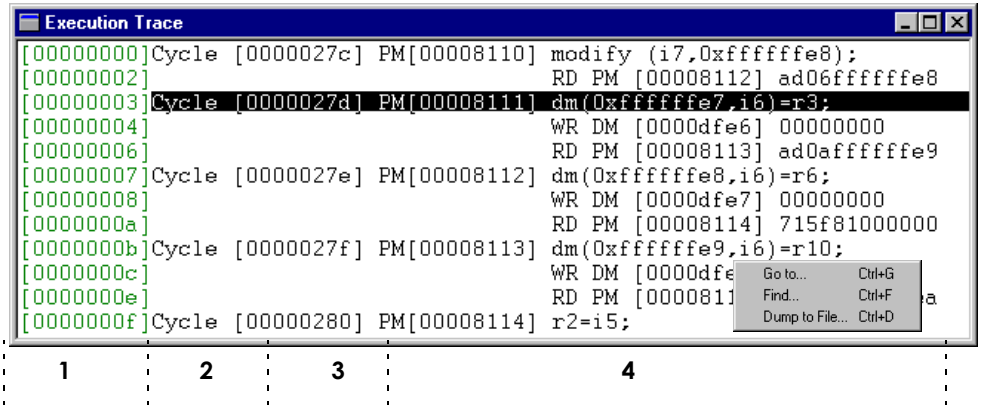


Figure 5-11. Trace Window and Short Cut Menu

The Execution Trace window displays the following information:

1. The buffer depth (instruction lines) you set in the Trace Buffer Depth dialog.
2. The cycle count.
3. Instructions executed such as memory fetches, program memory writes, and data/memory transfers.

Profile Window

Displays the results of the profile session that you set up from the Settings, Profile menu command. The window fields are described in Table 5-1.

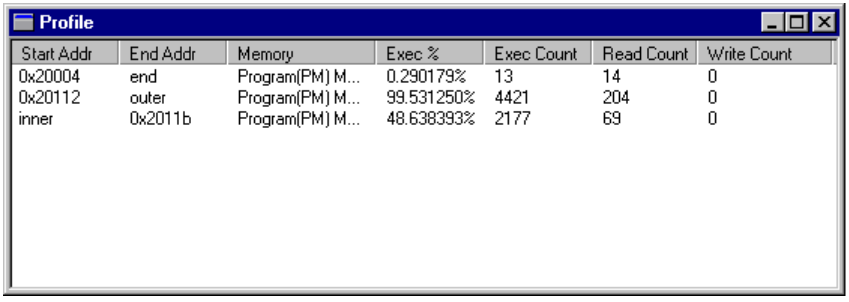


Figure 5-12. Profile Window

Table 5-1. Profile Window Descriptions

Window Field	Description
Start Addr	Starting address of this profile range (in hexadecimal value or symbol name).
End Addr	Ending address of this profile range (in hexadecimal value or symbol name).

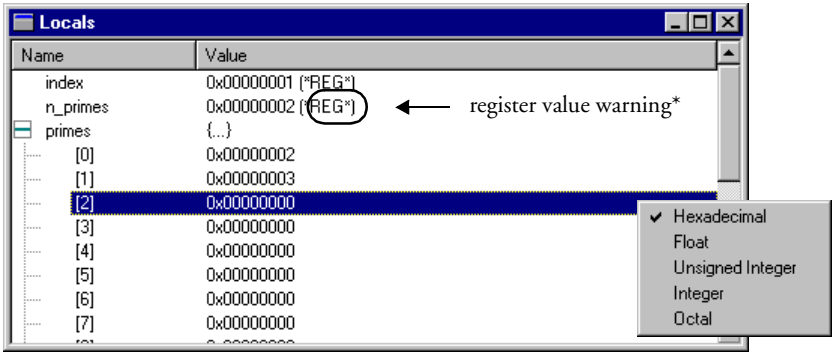
Table 5-1. Profile Window Descriptions (Cont'd)

Window Field	Description
Memory	Memory type
Exec%	Percent of time spent executing the current range
Exec Count	Number of instructions executed in the current range
Read Count	Number of memory locations read in the current range, including instruction fetches
Write Count	Number of locations written to in the current range

- Accelerator Keys:

Locals Window

Displays all local variables within a function. Use this window with the step or halt commands to display variables as you move through your program. Complex variables appear with a + sign. You can click on the plus sign to display all variable information. Right click in this window to display a short cut menu.



*The expression relies on a register value that may be incorrect because of the way registers are saved and restored on the stack. This is an issue only when changing the debugger's context with the `Call Stack` window.

Figure 5-13. Locals Window and Short Cut Menu

- Accelerator Keys:

Expressions Window

Lets you enter an expression to evaluate in your program. There are three types of expressions you can enter in this window:

1. Memory addresses

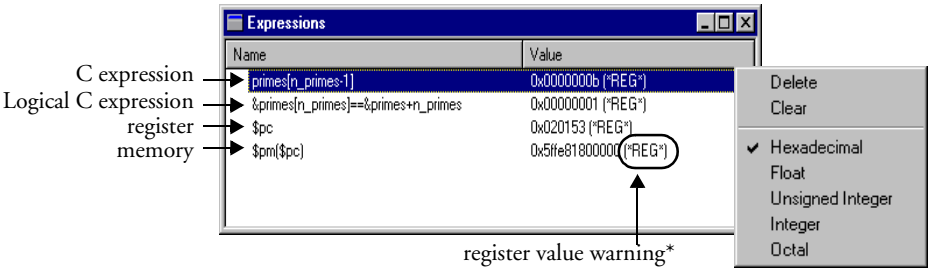
   Memory addresses can be either data (DM) or program (PM) and, either 16, 32, 48, or 64-bit addresses depending on the memory type and processor target. Memory identifiers must be preceded with a `$` sign (for example `$dm16(0x2000)`)

2. Register expressions

   All register names must be preceded by a `$` sign (for example, `$r0`).

3. C statements using standard C arithmetic and logical operators.

Right click in this window to display a short cut menu.



*The expression relies on a register value that may be incorrect because of the way registers are saved and restored on the stack. This is an issue only when changing the debugger's context with the `Call Stack` window.

Figure 5-14. Expressions Window and Short Cut Menu

- Accelerator Keys:

Call Stack Window

Lets you double click on a stack location and have the debugger move the call stack back to that previous debug context. This window only functions with C code.

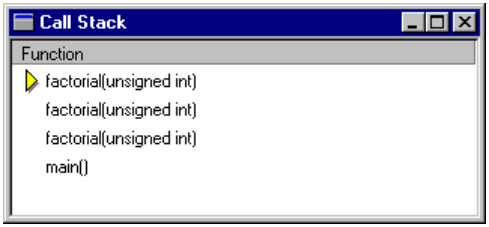


Figure 5-15. Call Stack Window

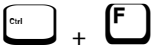
- Accelerator Keys:

Source Window

Opens the executable file's source file.

Find

Search for a specific text line in the active source, disassembly or memory window. Use the `Find Text` dialog to specify the text for the search.

- Keyboard Short cut 
- Accelerator Keys:

Find Text Dialog

Finds a text string in an active memory, source, or disassembly window. Character strings in the disassembly or source windows are case sensitive. If you enter incorrect search parameters or the search item was not found, a prompt appears in the output window and asks if you want to continue searching. The prompt also provides the location where the search stopped.

Figure 5-16. Find Text dialog

Find Again

Repeat the previous find command. Use the keyboard short cut F3 to continue searching.

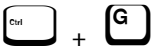
- Accelerator Keys: Alt V A
- Keyboard Short cut: F3

Go To Address

Go to a specific DSP memory address in an active window. Enter the address in the `Go To address` dialog. You can enter an address in

hexidecimal or integer (the debugger appends the 0x prefix). This command is also available in many debugger windows via menu short cuts.

- Accelerator Keys:

- Keyboard Short cut: 

Go to address Dialog

Enter the absolute DSP memory address or browse symbols in active window. Addresses are hexadecimal and must include the 0x prefix. Use the `Browse` button to locate and select symbols.

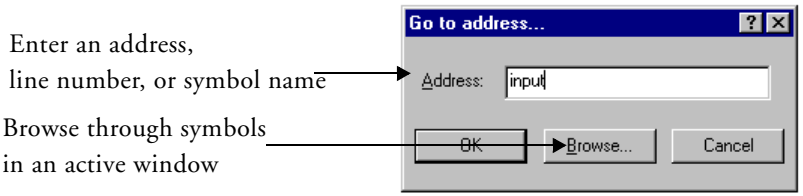


Figure 5-17. Go To Address Dialog

Register Menu Commands

Because the debugger lets you connect to different targets and simulate many different processors, some menus and dialogs are dynamic; they display options and commands unique to that processor. Register and memory menus change depending on the processor or target being debugged.

The following sections describe the commands that always appear in these menus; for descriptions of specific processor memory and registers, refer to that processor's chip manual and data sheet. For descriptions of hardware targets, see the documentation that accompanies that target.

The `Register` menu provides access to all processor registers. You can view and modify the register values during a debug session without effecting the source code. For more information, see "Register Window Operations" in Chapter 4.

Custom

Use the `Custom` command to customize a register window. This is done in the `Select Registers to Display in a Window` dialog. Only registers specific to the target processor are available. The custom display is not saved on exit from the debugger.

- Accelerator Keys:

Select Registers to Display in a Window Dialog

In the dialog, click on the register you wish to monitor and then press `Add` to select a register to display or click on `Remove` to delete a displayed register. After you complete your register selections, type in a name for the

display in `Title of Window` dialog field. This setup is not saved when you exit the debugger.

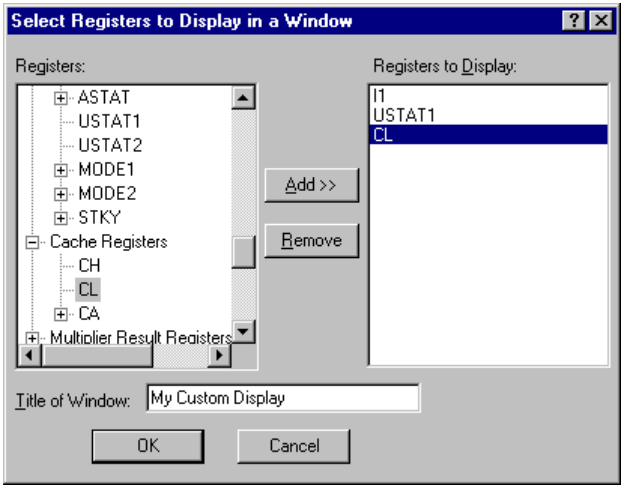


Figure 5-18. Select Registers to Display in a Window

Memory Menu Commands

Because the debugger lets you connect to different targets and simulate many different processors, some menus and dialogs are dynamic; they display options and commands unique to that processor. Register and memory menus change depending on the processor or target being debugged.

The following sections describe the commands that always appear in these menus; for descriptions of specific processor memory and registers, refer to that processor's chip manual and data sheet. For descriptions of hardware targets, see the documentation that accompanies that target.

The `Memory` menu provides access to memory windows and the `Fill`, `Dump`, `Memory Map` and `Plot Memory` dialogs. You can use these commands to modify memory during a debug session without effecting you source code. For more information, see "Memory Window Operations" in Chapter 4.

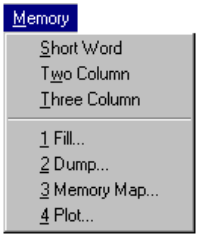


Figure 5-19. Memory Menu

- Accelerator Keys:

Fill

Opens the `Fill Memory` dialog. This dialog lets you fill program or data memory from a file. You can also fill a range of memory with a value, such as 0, in order to clear a buffer.

- Accelerator Keys:

Fill Memory Command Dialog

Fills a range of memory in an active data or program memory window. You may fill from a file or enter a value in the value field.

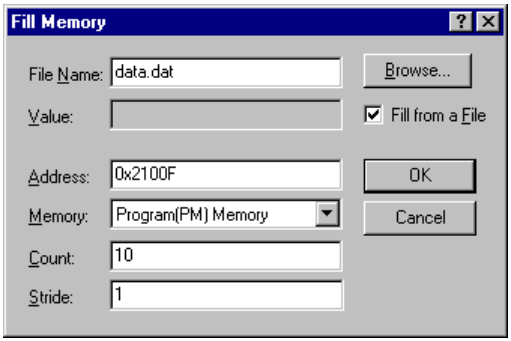


Figure 5-20. Fill Memory Dialog

Table 5-2. Fill Memory Dialog Field Descriptions

Field	Description
File Name	Use the Browse button to select the path and data (.dat) file from which to fill memory.
Browse	Opens the Select Input File name For memory Fill dialog. See File name above.
Value	Fills memory with a single value (not from a file).

Table 5-2. Fill Memory Dialog Field Descriptions (Cont'd)

Field	Description
Address	Starting address of memory fill.
Memory	Memory type to fill.
Count	The number of addresses to fill.
Stride	The number of addresses between fills.

Dump

Opens the `Dump Memory` dialog. To dump memory to a file, check the `Dump to a File` box. Otherwise, memory is dumped to the Output window.

- Accelerator Keys:

Dump Memory Command Dialog

Dumps memory from an active program or data memory window. Check the `Dump to a File` box and use the `Browse` button to navigate to an existing file or to enter a new file name in the `File Name` field in the dialog. If the `Dump to a File` box is not checked, the debugger dumps the selected memory to the `Output` window. Descriptions of the dialog fields are in Table 5-3 on page 5-26.

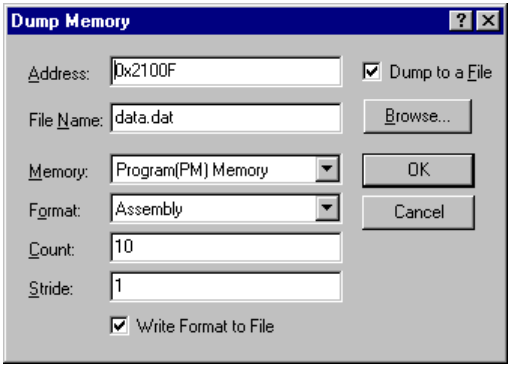


Figure 5-21. Dump Memory Dialog

Table 5-3. Dump Memory Dialog Field Descriptions

Field	Description
Address	Address to start removing memory.
File Name	Use the Browse button to select the path and data (.dat) file to dump memory to.
Browse	Opens the Select Input File name For memory Dump dialog. See File name above.
Memory	Memory type.
Format	The number format of the memory.
Count	The number of addresses to dump.
Stride	The number of addresses between dump locations.
Write Format to File	Controls the data format is written to the file (see Format above). This lets the debugger read the data back into the file using the correct format. If you uncheck this box, the format is not be written to the file. All of the data is then written to the file in ASCII with one memory item on a line.

Plot

Opens the `Plot Configuration` dialog from which you can graphically plot a range of memory.

- Accelerator Keys:

Plot Configuration Dialog

Sets up the parameters of the memory plot you want to generate. Descriptions of the dialog fields are in Table 5-4.

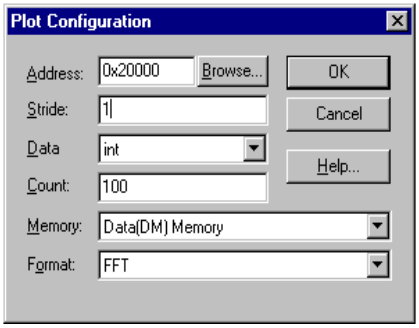


Figure 5-22. Plot Configuration Dialog

Table 5-4. Plot Memory Dialog Field Descriptions

Field	Description
Address	Memory address to start plotting from.
Stride	The number of addresses between plotted addresses. Unlike the Dump command which uses absolute address, the stride field in the plot works with two variables; word length and data type.
Data	Data type that the plotted memory represents.

Table 5-4. Plot Memory Dialog Field Descriptions (Cont'd)

Field	Description
Count	The number of addresses to plot.
Memory	Memory type to plot.
Format	Format of DSP transformation applied to the converted memory.

Memory Map

Displays the memory map of the processor you selected.

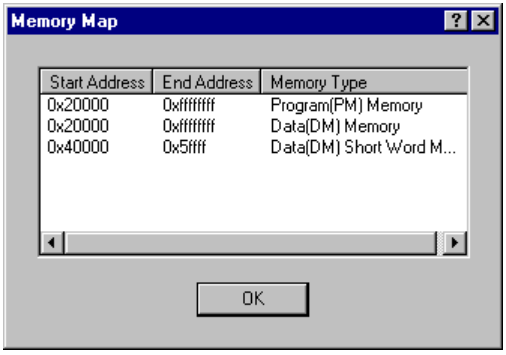


Figure 5-23. Memory Map Dialog

- Accelerator Keys: Alt M M

Debug Menu Commands

Use the `Debug` menu to control program execution. The `Debug` menu contains the following commands:

Figure 5-24. Debug Menu

- Accelerator Keys:

Run

Runs your executable file. The program runs until some event stops it, such as hitting a breakpoint, watch point or user halt command. When the debugger is halted, all windows are updated to current addresses and values.

- Accelerator Keys:

- Keyboard Short cuts:

Halt

Stops program execution. All windows are updated after the program actually halts. Register values that have changed are highlighted and the status bar displays the address where your program has halted.

- Accelerator Keys:

Run To Cursor

Runs your program to the line where you left your cursor.

- Accelerator Keys:

Step Over

Steps one source line. If the source line calls any function, these functions are executed in their entirety. This function is available in C only.

- Accelerator Keys:

- Keyboard Short cut:

Step Into

Step through your program one source or assembly code line at a time. As you step, instructions are executed and windows updated.

- Accelerator Keys:

- Keyboard Short cut:

Step Out Of

Steps until the current function has returned to its caller. This function is available in C only.

- Accelerator Keys
- Keyboard Short cut:

Reset

Resets the target to a known state. When you are connected to a hardware platform, reset acts like pulling the reset pin low. The contents of processor memory changes, and you must reload your program into the target.

- Accelerator Keys:

Restart

Sets your program to the first address of the interrupt vector table. In the simulator, this works like reset, except that the target's memory does not change. All registers are reset to 0.

- Accelerator Keys:

Multiprocessor

Opens a submenu that contains debug commands in a multiprocessor system. The MP commands work exactly like the single processor commands except that they work synchronously on all active processors in your MP session. Note that you can use pinning, or the individual processor tabs in the Output window, in conjunction with the single `Debug` commands to debug individual processors in an MP session.

Multiprocessor Run

Runs all selected processors until some event such as a breakpoint or a halt command stops execution.

- Accelerator Keys: Alt D M R
- Keyboard Short cut: Alt F5

Multiprocessor Halt

Stops program execution in all selected processors.

- Accelerator Keys: Alt D M H

Multiprocessor Step

Steps through program code on all selected programs one line at a time.

- Accelerator Keys: Alt D M S
- Keyboard Short cut: Alt F11

Multiprocessor Restart

Resets and reloads the programs in all selected processors and runs to main (if selected) from the first address of the interrupt vector table.

- Accelerator Keys:

Multiprocessor Reset

Resets all processor registers to a known state. This command does not affect processor memory; you do not need to reload the programs after using this command.

- Accelerator Keys:

Settings Menu Commands

The `Settings` menu lets you access commands that analyze the runtime behavior of your DSP program and enable I/O capabilities, and simulate source to target data streaming.

- Accelerator Keys:

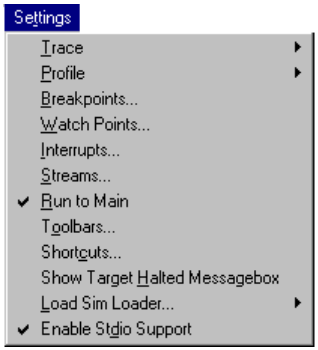


Figure 5-25. Settings Menu

Trace

Trace instructions in program memory. This command invokes the `Trace` sub menu. For more information, see “Following Program Execution (Trace)” on page 4-16.

- Accelerator Keys

Set Trace Depth

- Invokes the `Trace Buffer Depth` dialog. Set depth of trace (number of instructions) in the `Custom Depth` field. Use the default value of 0 to set maximum depth (limited by your system's virtual memory). Select `Maximum Trace Depth` to choose a maximum trace.

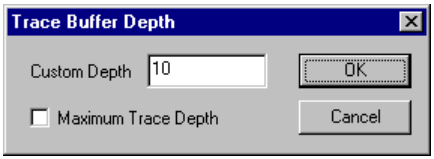


Figure 5-26. Trace Buffer Depth Dialog

- Accelerator Keys: Alt T T D

Clear Trace

Clears the trace you set up.

- Accelerator Keys: Alt T T C

Enable Trace

The debugger's default setting is `Trace disabled`, so you must select `Enable Trace` to use this feature.

- Accelerator Keys: Alt T T E

Profile

Profiles your DSP executable program's runtime behavior. This function helps you find areas of code that may be optimized for better performance.

The `Profile` command invokes the `Profile` menu. For more information, see “Optimizing Code Operation (Profile)” on page 4-19.

- Accelerator Keys:

Add/Remove Profile Ranges

Invokes the `Profile Ranges` dialog. For an example, see Figure 5-27 on page 5-37.

- Accelerator Keys:

Reset Profile Information

Clears the profile information from the last profile session, so you can rerun the session.

- Accelerator Keys:

Enable Profiling

You must select `Enable Profiling` to use the `Profile` feature.

- Accelerator Keys:

Profile Ranges Dialog

Sets up a profile session. Addresses may be represented as symbols or hexadecimal numbers. Select `Browse` to choose program memory labels. Profile results and ranges are not saved when you exit the debugger.

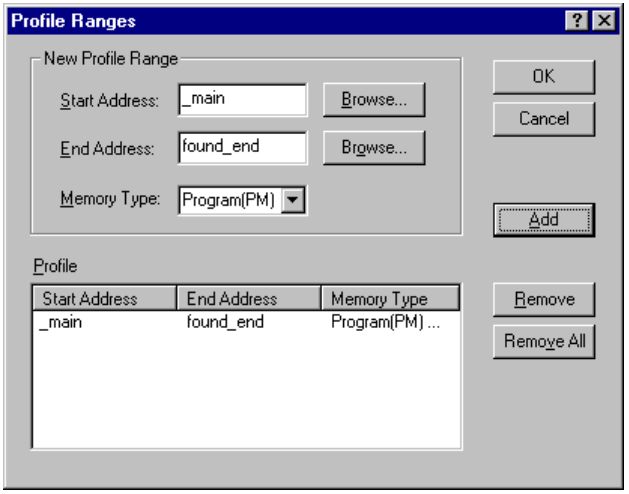


Figure 5-27. Profile Ranges Dialog

To use the profiler, you must perform the following steps:

1. Define the memory type to profile: either `PM` or `DM`.
2. Select a `Start` and `End address` range to profile.
3. `Add` these addresses to the profile session.
4. Enable profiling through the `Settings`, `Profile`, `Enable` command.
5. Run your program to collect the data from the beginning.

   The profile window (see `View`, `Debug Windows`, `Profile` command) is updated with the results of the session.

Breakpoints

Opens the `Breaks` dialog. Use this dialog as to manage break points in your executable program. Breaks may be set at any address in program memory and you can set up to a maximum of 28 breakpoints. Program execution halts at the address just prior to the breakpoint.

- Accelerator Keys:

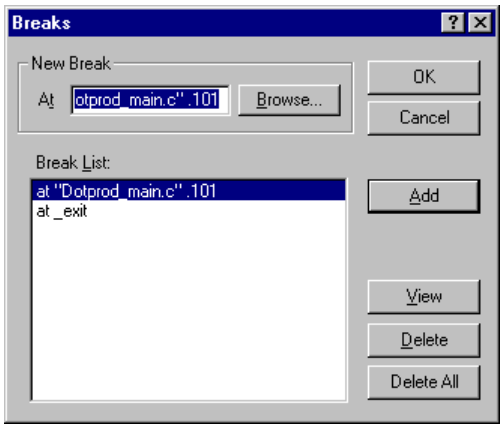


Figure 5-28. Breaks Dialog

Watch Points

Works like break points except that watch points trap on a specified condition. You can set memory watch points in registers, stacks, or memory ranges. When the condition is reached, the debugger halts and updates all registers. There are three dialogs that define watch points, Registers (Figure 5-29), Hardware Stacks (Figure 5-30), and Memory (Figure 5-31). The following figures and tables show and explain the various watch points you can use.

To set up any memory watch point, you must do the following steps:

1. Define a memory range and a memory type to watch.
2. Choose to watch memory locations inside or outside the range.
3. Choose the halt conditions.
4. Press the `Add` button.

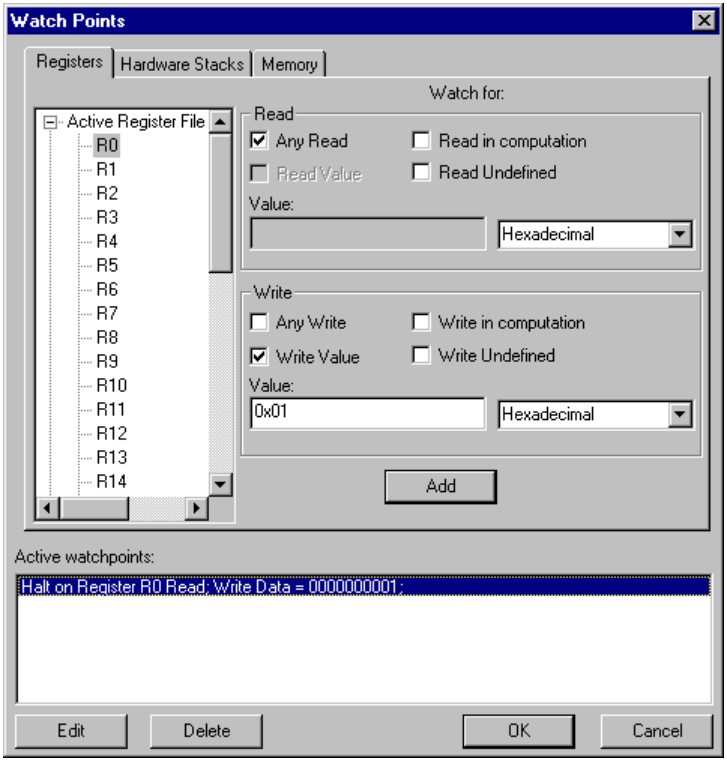


Figure 5-29. Watch Point Registers Dialog

`Watch Points`, `Register` dialog fields are described below:

Table 5-5. Watch Points, Register Dialog Fields

Dialog Field	Description
Register List	The scroll list provides access to all available ADSP-21xxx registers. Click on the + symbol to expand the register list.
Watch For Read	Halt the target when undefined value, any value, or a specific value from a specified register is read from the register.
Watch For Write	Halt the target when undefined value, any value, or a specific value from a specified register is written from the register.
Add, Edit, Delete	Use these buttons to manage the watch points list.

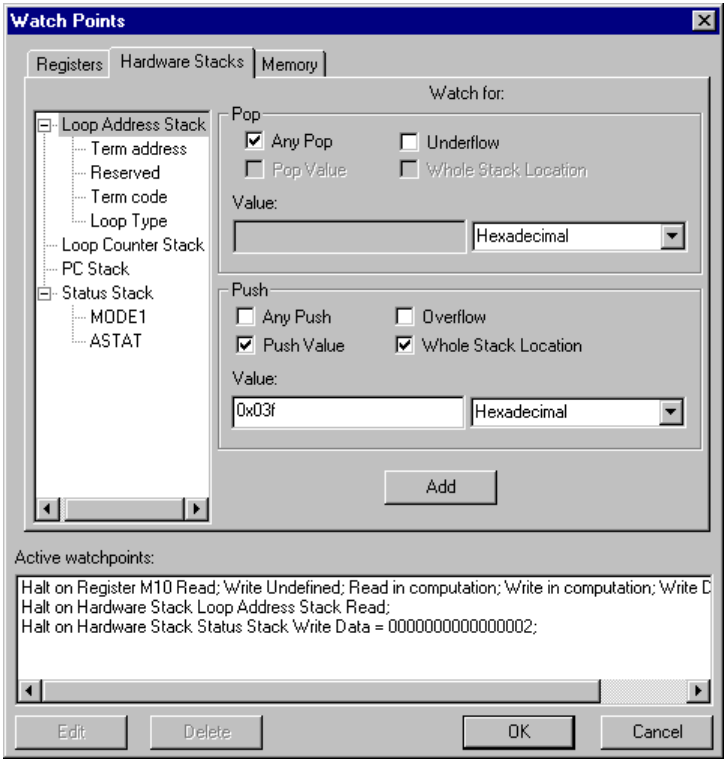


Figure 5-30. Watch Points Hardware Stacks Dialog

`Watch Points`, `Hardware Stacks` dialog fields are described in Table 5-6.

Table 5-6. Watch Points, Hardware Stacks Dialog Fields

Dialog Field	Description
Watch For Pop	Halt the target when undefined memory, any value, or a specific value is popped from a specified stack.
Watch For Push	Halt the target when undefined memory, any value, or a specific value is pushed onto the specified stack.

Table 5-6. Watch Points, Hardware Stacks Dialog Fields (Cont'd)

Dialog Field	Description
Read Underflow	Halt the target when an underflow occurs while reading from the specified stack.
Write Overflow	Halt the target when an overflow occurs while writing to the specified stack.
Add, Edit, Delete	Use these buttons to manage the watch points list.

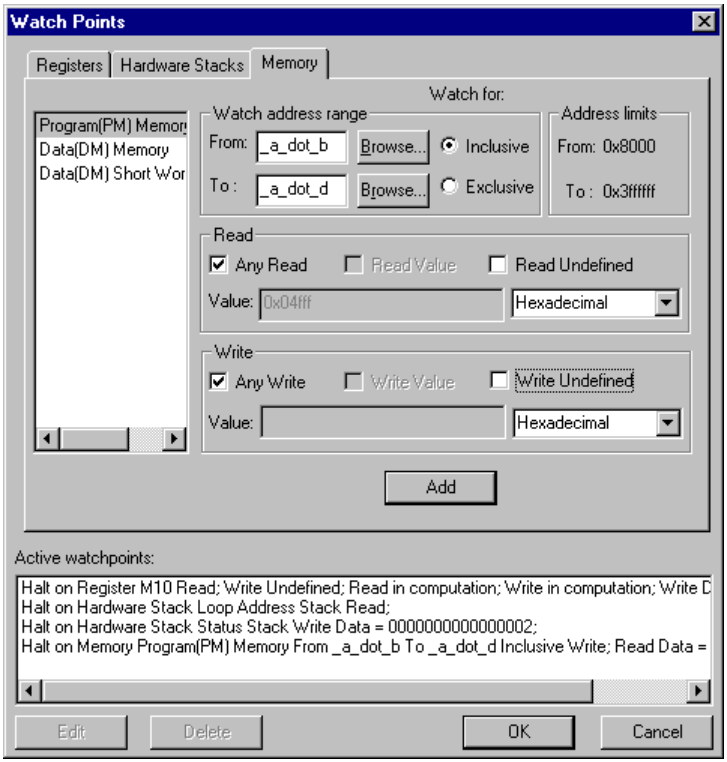


Figure 5-31. Watch Points, Memory Dialog

The `Watch Points, Memory` dialog fields are described in Table 5-7.

Table 5-7. Watch Points, Memory Dialog Fields

Dialog Field	Description
Watch For	Select the memory type (either DM or PM) from the list. Select the memory range in the From Address and To Address fields. Allowable memory range is shown in the Address Limits field.
Inclusive	Watch memory locations including end points.
Exclusive	Watch memory locations excluding end points.
Watch For Read	Halt the target when undefined memory, any value or a specific value is read from the specified memory range.
Watch For Write	Halt the target when undefined memory, any value or a specific value is written to the specified memory range.
Add, Edit, Delete	Use these buttons to manage the watch points list.

- Accelerator Keys:

Interrupts

Simulate external interrupts in your program. When you use interrupts with watch points and streams, your program simulates real world operation of your DSP system.

- Accelerator Keys:

Interrupt Timing Dialog

Selects the timing of the interrupt you want to generate in the `External Interrupts` field. For complete information on external interrupt pins, see

the processor user manual for the processor you are debugging. The dialog fields are described in Table 5-8 on page 5-44.

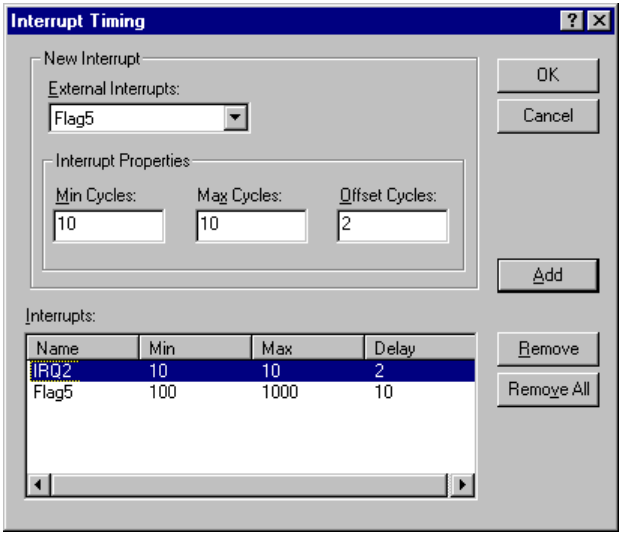


Figure 5-32. Interrupt Timing Dialog

- Accelerator Keys:

Table 5-8. Interrupt Timing Dialog Field Descriptions

Field	Description
External Interrupts	The name of the periodic signal.
Min Cycles	Minimum interval between occurrences of interrupt signals in instruction cycles.
Max Cycles	Maximum interval between occurrences of interrupt signals in instruction cycles.
Offset Cycles	Number of instruction cycles before first interrupt is generated (default = 0).

Table 5-8. Interrupt Timing Dialog Field Descriptions (Cont'd)

Field	Description
Interrupts:	List of configured interrupts.
Add, Remove, Remove All	These buttons let you manage the interrupts listed in the Interrupts field.

Streams

Sets up a Serial Port (SPORT) transmit and test SPORT activity with an external interrupt (see "Interrupts" on page 5-43). The `Streams` command opens the `Streams` dialog.

Streams Dialog

Set up a SPORT or other I/O simulation. Streams dialog fields are described in Table 5-9 on page 5-46. For an example of using streams, see "Simulating Data Input/Output Operations (Streams)" on page 4-27.

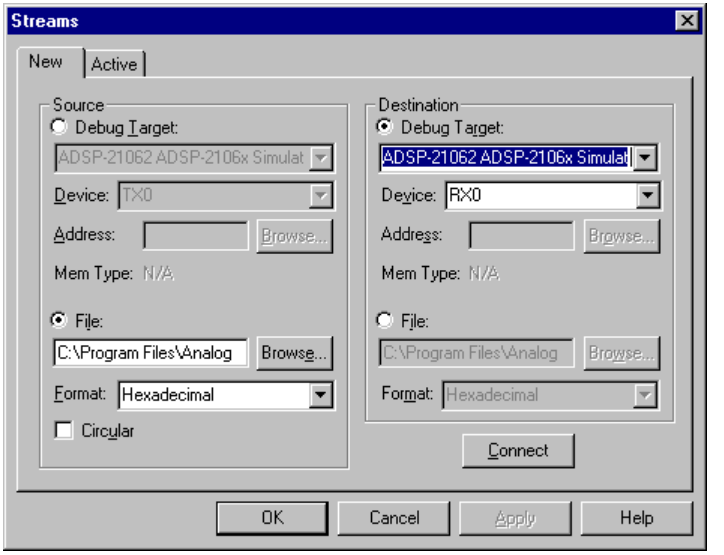


Figure 5-33. Streams Dialog

- Accelerator Keys: Alt T S

Table 5-9. Streams Dialog Field Descriptions

Dialog Field	Description
Source	Select the source of the data stream, (a debug target or file).
Device	List of streamable devices in selected debug target.
Address	Address of memory-mapped I/O port. See Mem Type below.
Mem Type	Type of memory mapped I/O port. This field is only valid if the device selected is a memory-mapped I/O port.
File/Browse	Invokes the Open a Source File dialog from which you can open a data (.dat) file.

Table 5-9. Streams Dialog Field Descriptions (Cont'd)

Dialog Field	Description
Format	A number format for the data.
Circular	If checked, and end of file is reached while debugger is running, the debugger starts reading data from the beginning of the file.

Run To Main

At program load, the debugger opens a source file and runs to the function `Main ()`. `Run To Main` acts like a breakpoint at the line previous to the function `Main ()`.

- Accelerator Keys:

Toolbars

Controls appearance, and type of toolbar to display. The `Customize` dialog lets you change the look and contents of the debugger's standard toolbars.

Customize Dialog

Control the appearance and set up a custom toolbar. The toolbars may be repositioned anywhere within the debugger by clicking on any space that is not an icon and dragging the toolbar to the desired position.

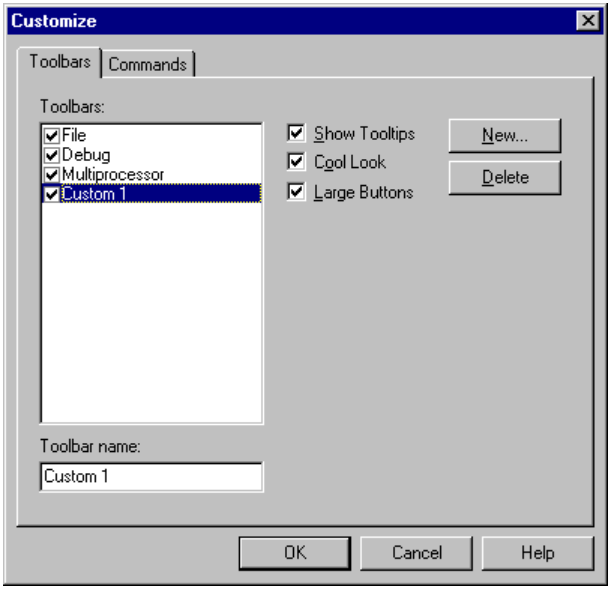


Figure 5-34. Customize (Toolbars) Dialog

Table 5-10. Customize Dialog Field Descriptions

Dialog Field	Description
Toolbars:	The list of all toolbars including any custom toolbars. Check a box to display the toolbar.
Show Tooltips	When you place your cursor over a toolbar icon, a popup describes that icon.
Cool Look	Displays toolbar buttons as a seamless toolbar.
Large Buttons	Increases toolbar button size.

Table 5-10. Customize Dialog Field Descriptions (Cont'd)

Dialog Field	Description
New...	Opens the New Toolbar dialog. This dialog lets you name and design your new toolbar.
Reset/Delete	When you change a standard toolbar display, Reset applies the change. To change to default settings, set up the dialog to the settings in Figure 5-34. When you select a custom toolbar this button changes to delete, letting you delete the selected custom toolbar.

The Customize Commands dialog lets you change the contents of selected toolbars

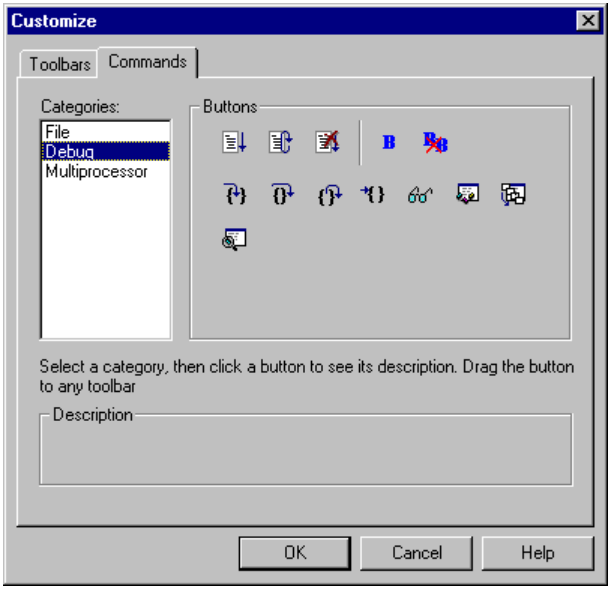


Figure 5-35. Customize (Commands) Dialog

Table 5-11 is the list of all toolbar icons and their actions.

Table 5-11. Debugger Toolbar

	Open a new file
	Find text
	Repeat find text
	Go to an address in memory
	Context help
	Start or continue current program
	Restart the current program
	Halt the program (processor)
	Toggle break point
	Clear all current breaks
	Step into an instruction or line
	Step over
	Step out of a function or loop
	Run to cursor

Table 5-11. Debugger Toolbar (Cont'd)

	Open the Expressions window
	Open a locals window
	Open the call stack window
	Open a disassembly window

- Accelerator Keys:

Short Cuts

Lets you add new or modify existing debugger short cuts. If the keyboard short cut that you choose is already assigned, the menu command is displayed in the `Assign Short cut` dialog. You can override that key assignment or remove assigned short cuts by selecting a short cut from the `Assigned Short cuts` list and pressing the remove button.

Show Target Halted Message Box

The `Target Halted` message is displayed whenever your target halts. This command turns on/off this message.

Load Sim Loader

Opens a submenu which contains the following commands. For more information, see "Loader Dialog Options" in Chapter 3.

Boot from Host

Sets your DSP system to boot from a simulated host processor. To do this, you must set the correct options in the IDE loader dialog. An example can be found in "Simulating Processor Booting" on page 4-32.

Boot from PROM

Sets your DSP system to boot from a simulated PROM. To do this, you must set the correct options in the IDE loader dialog. An example can be found in "Simulating Processor Booting" on page 4-32.

Enable Stdio Support

The debugger supports several standard primitive I/O functions such as `open`, `read`, `write`, and limited `printf`. If you turn this selection off, your program does not output results to the Output window or a file. For more information, see the *C Compiler and Library Manual for ADSP-21xxx Family DSPs*.

- Accelerator Keys

Emulator Commands

The following commands appear in the `Settings` menu when the Debug Target you select (see Figure 5-6 on page 5-9) is an ADSP-21000 JTAG Emulator.

Target Options Command

Opens the `Target Options` dialog. The dialog fields are described in Table 5-12.

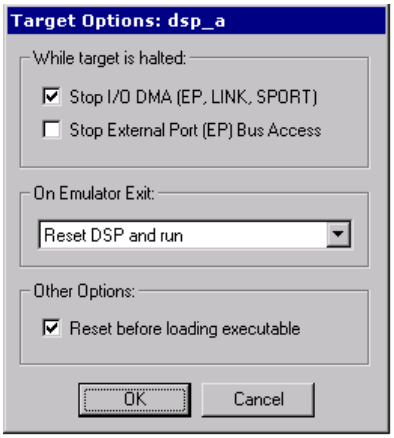


Figure 5-36. Target Options Dialog

Table 5-12. Target Options Dialog Field Descriptions

Dialog Field	Description
Stop I/O DMA	Disable I/O DMA while the emulator has control of the DSP.
Stop External Port (EP) Bus Access	Disable EP Bus access while the emulator has control of the DSP.

Table 5-12. Target Options Dialog Field Descriptions (Cont'd)

Dialog Field	Description
On Emulator Exit	When you exit the emulator/DSP session, this field determines the state the DSP is left in when the software releases control. Choices are as follows: • Reset DSP and Run — Resets the DSP and starts program execution at the reset vector (0x80005-21065L, 0x200005-2106x). • Run from current PC — This halts the DSP (if necessary) and then resumes DSP operation at the current PC.
Reset before loading executable	When you load a DSP executable file with the File, Load command, this check box controls whether or not the DSP is reset prior to the load. Use this option when the DSP registers must not be changed to their reset condition when a file load occurs. For example, when external program memory accesses that require the SYSCON and WAIT (plus the IOCTL and SDRDIV for the ADSP-21065L) registers to be correct before a load begins. In this case, you should 1) reset the chip, 2) modify the registers to enable external memory access, 3) make sure this flag is not checked, 4) load the program, and 5) run the program.

To use external memory or to load programs into external memory, the SYSCON and WAIT registers must be set. To do this:

1. Start the debugger (Do NOT load a program).
2. From the `Settings` menu, select `Target Options`.
3. In the `Target Options` dialog (Figure 5-36 on page 5-53), uncheck the `Reset before Loading Executable` check box.
4. From the `Debug` menu, select `Reset`.
5. From the `Register` menu, open the SYSCON (plus the IOCTL and SDRDIV for the ADSP-21065L) registers and change the SYSCON MSIZE bits and the WAIT register bits appropriately.

6. Load your program.

Hardware Breakpoints Command

This dialog lets you enable and disable the SHARC hardware breakpoints and is shown in the following pages. Hardware breakpoints work similarly to watch points; you can set breaks on instructions, register reads and writes, or data transfers within a user defined memory range. You can choose to break on all of the defined event types in the range or to skip any number of defined event.

Hardware breakpoints are divided into groups, which are delineated with the tabs in the dialog. Each group has a set of common dialog attributes, which are as follows:

Start Address, End Address — The start and end address (inclusive) that triggers the breakpoint. To breakpoint a single address set START=END ADDRESS.

Exclusive — If this is checked, the breakpoint occurs for access operations outside of the START to END address (inclusive) range.

Mode — For `Data` and `Other` access breakpoints only. This determines which modes triggers the breakpoint. Choices are:

Disabled — Disables this breakpoint.

On Write — Triggers breakpoint on Write access to the specified memory range.

On Read — Triggers breakpoint on Read access to the specified memory range.

Any access — Triggers breakpoint on Read/Write access to the specified memory range.

Global Breakpoint Options

Skip N Breakpoint Events — Counts down each time a hardware breakpoint condition occurs. When the count reaches zero (0), the DSP processes the break. This counter may also be used to count the number of times a break operation occurs. Breakpoints within the group are OR'ed together to create this condition.

Restore Skip Count — When checked, the ICE restores the `Skip Count` to the value it was on program RESTART. Otherwise, it leaves it set to the current value.

AND All Breakpoints — Normally each of the Group interrupts are "OR'd" together to create a composite interrupt. With this flag checked the DSP "ANDs" the selected breaks within the group together.

Hardware breakpoints do not assert until two (2) instruction cycles AFTER the break condition occurs.

When you use hardware breakpoints, do not place breaks at addresses where a `JUMP`, `CALL`, or `IDLE` instruction would be illegal. Do not try to place breakpoints in the last few instructions of a `DO LOOP` or in the delay slots of a delayed branch. The delay slots are the instructions between a delay branch instruction and the actual branch. For more information on theseilleagle locations, see the chip's user manual.

Data Breakpoints

Accesses from DAG1 or the DM() modifier are trapped by this breakpoint. Specify 2 address ranges for DM Data access breakpoints. These are always "OR'd" to generate the Data Breakpoint condition. The data

breakpoints should be specified for breaks to internal memory (including short word space) for IOP register access and EP and MMS accesses.

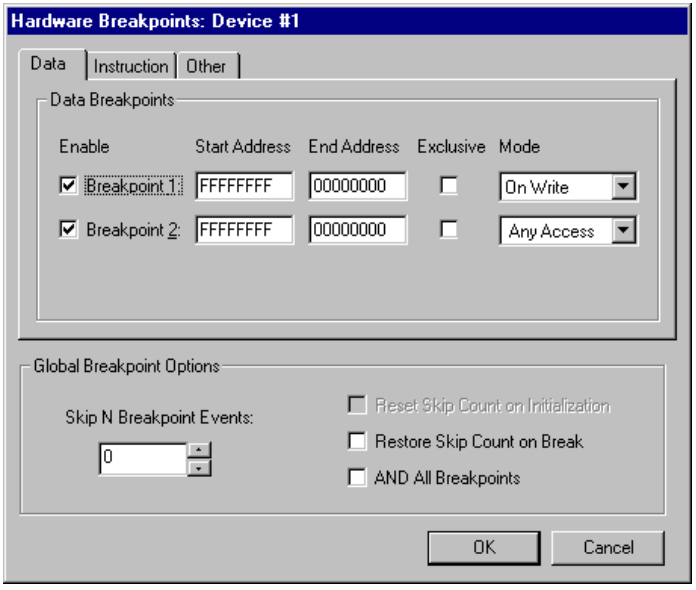


Figure 5-37. Hardware Breakpoints Dialog (Data Breaks Tab)

Instruction Breakpoints

Breakpoint occurs after a DSP instruction is executed within the addresses specified. You may specify four different Instruction access breakpoints. These are always “OR’d” to generate the Instruction Breakpoint condition.

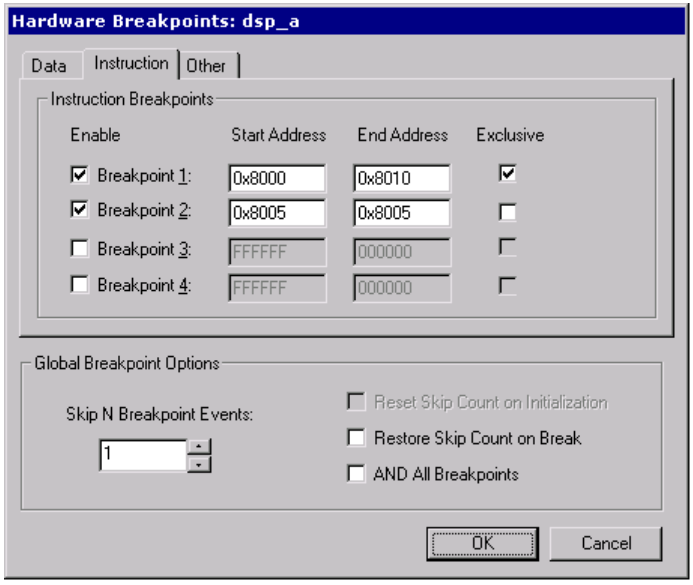


Figure 5-38. Hardware Breakpoints Dialog (Instruction Breaks Tab)

Other Breakpoints

PM Data — Break occurs from accesses using DAG2 or the PM() modifier. The PM and DM data breakpoints should be specified for breaks to internal memory (including short word space) for IOP register access and EP and MMS accesses.

I/O (includes DMA, MMS and host accesses) — Break occurs when DMA, MMS, and host accesses occur.

External Port (includes core or master mode DMA accesses) —Break occurs at external port or master mode DMA core accesses.

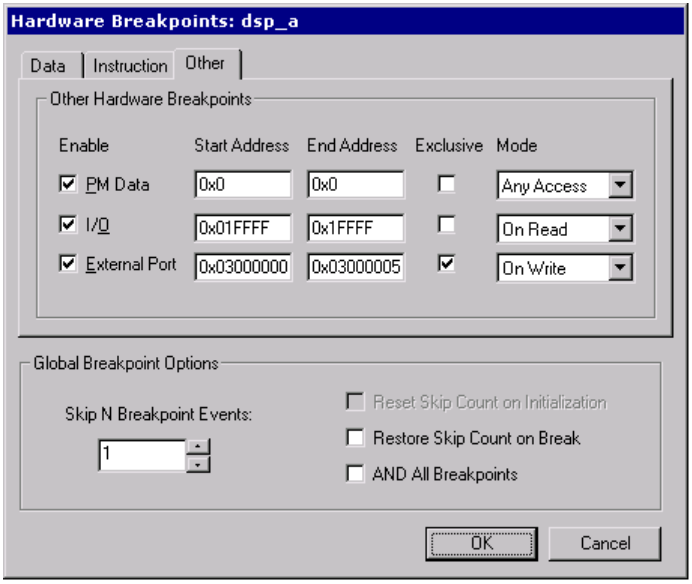


Figure 5-39. Hardware Breakpoints Dialog (Other Breaks Tab)

All of the valid hardware breakpoints accessed through the `Hardware Breakpoints` dialog are summarized in Table 5-13 where:

RAM = Internal Random Access Memory;
Ext. = External Memory;
IOP = Input/Output registers.

Table 5-13. Valid Hardware Breakpoints

Breakpoint Type	Access Type								
	Core			DMA			Slave (MMS or Host)		
	RAM	Ext.	IOP	RAM	Ext.	IOP	RAM	Ext.	IOP
DM Data 2 pins	✓	✓	✓						
PM Data 1 pin	✓	✓	✓						
I/O 1 pin				✓			✓[1]		
External Port 1pin		✓			✓				
Instruction 4 pins	✓	✓	✓						

[1] Note: Direct slave access of internal RAM is not available on the ADSP-21065L.

Context Help

Gets help on some portion of the VisualDSP Debugger. When you choose the Toolbar's Context Help icon, the mouse pointer changes to an arrow and question mark. Click anywhere in the application window, such as another Toolbar icon. The Help topic is shown for the item you clicked.

- Keyboard Short cut:

VisualDSP Debugger Glossary

Available Registers — for information on available primary and second processor registers, see the corresponding processor documentation.

Breaks Command — this command provides a user defined halt in an executable program. Break points may be toggled (turned on or off) by double clicking on a location in a memory window.

Executable File — this is a file or program is a file that has been written and built in the VisualDSP environment.

Go To Command — this command moves the cursor to an address location in a memory window.

Librarian—The librarian is a utility that groups object files together into library files. When you link your program, you can specify a library file and the linker automatically link any file in the library that contains a label used in your program. Source code is provided so you can adapt the routines to your needs.

Linker—The linker processes separately assembled object files to create a single executable program. It assigns memory locations to code and data in accordance with a user-defined architecture file, a text file that describes the memory configuration of the target system. The linker inputs one or more object files and outputs an executable file.

Loader—The loader is a utility tool that transforms an executable file into a boot file. For the ADSP-21xxx SHARC, the loader creates a small kernel which is booted into internal memory at chip reset so that a program of arbitrary size can be loaded into the ADSP-21xxx's internal and external memory.

Platform — this is an individual target you select. For instance, if you have three emulators installed on your system, a platform selection might be emulator two.

Plot Command — this command graphically plot a range of memory.

Processor — this is an individual chip contained on a specific platform within a target.

Restart Command — this command sets your program to the first address of the interrupt vector table. Unlike a reset, you do not need to reload memory.

Reset Command — this command resets the processor to a known state, clearing processor memory.

Right Click— this action opens a short cut menu in the window you have right clicked. The short cut menus provide access to many features such as search and changing number formats.

Simulator — the simulator executes an ADSP-21xxx executable program in software in the same way that an ADSP-21xxx processor would in hardware. The simulator also simulates the memory and I/O devices specified in the architecture file. The user interface lets you interactively observe and alter the data in the processor and in memory. The simulator reads executable files and an architecture file.

Stepping — these commands move through your source or assembly code in various ways, letting you observe instruction execution.

Symbols — this is the label for a section, subroutine, variable, data buffer, constant, or port name. For more information on symbols see the reference section of the related build tool documentation.

Target— this is the selected software driver that you want to use for debugging. Options include simulators or emulators. You can have several targets installed on your system.